

"Rausch, Lawrence"  
<lrausch@nsf.gov>

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To <innovationmetrics@doc.gov>

cc "Carlson, Lynda T" <lcarlson@nsf.gov>

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Attn: Dr. Elizabeth "E.R." Anderson

We appreciate the opportunity to provide input in support of the efforts by the Measuring Innovation in the 21<sup>st</sup> Century Economy Advisory Committee. The Committee's charge, "... to develop better innovation metrics that can inform policy decisions and enable policymakers to better monitor innovation" is an important one and one that the National Science Foundation (NSF), through its Division of Science Resources Statistics, has been active in for some time.

We want to be sure that you are aware of the work being done by NSF's Division of Science Resources Statistics (SRS) especially in the area of our academic and industry R&D surveys redesign efforts, our cooperation with the Bureau of Economic Analyses to develop an R&D satellite account and to link micro data to provide insights to the globalization of industrial R&D activities, and the report we produce for the National Science Board presenting national and international indicators on the science and engineering enterprise. Data for several metrics mentioned by committee members at its February 22, 2007 public meeting (e.g., trends in U.S. industry market share (U.S. share of global industry value added), in U.S. and global patenting trends, in national and international R&D performance, and trends in labor productivity)) are pulled together from private databases, international organizations, and Federal statistical agencies and presented in the National Science Board's (NSB) Science and Engineering Indicators report. The Science and Engineering Indicators report presents important data that should be considered as you go about building foundations for the new innovation metrics.

In FY 2003, SRS commissioned a comprehensive review by the National Academies' *Committee on National Statistics (CNSTAT)* of its portfolio of Research and Development survey activities. The published report, "Measuring Research and Development Expenditures in the U.S. Economy", contained 33 specific recommendations addressing how the current R&D data collection system can be improved, with a particular focus on data quality from the Survey of Industrial Research and Development (SIRD). Consistent with CNSTAT recommendations and OMB guidance, in FY 2005 RDS initiated a program of field observation visits to examine R&D record-keeping practices of companies and to conduct research on how respondents

fill out the forms. As part of this effort, the study investigated whether companies can report by more specific and detailed categories (e.g., by line of business and by type of R&D) and will be used to assess the feasibility of respondents providing this additional detail and the burden it would actually impose on reporters. SRS also initiated the establishment of an Industry Expert Panel to advise SRS on priorities and strategies for ongoing activities to improve the relevance of the statistics produced from the SIRD, the result of which has been to identify metrics used by R&D performing companies and to guide our ears of future data collection. We are in the middle of redesigning our industry R&D survey to incorporate a module approach for data collection, differentiating among financial, human resources, R&D technical, and IP/licensing indicators. We are in the infancy stage of considering the development of an innovation-specific module as well.

SRS also has underway two major interagency projects that promise to add new light on the role of R&D, technology and innovation in economic competitiveness and the overall economy. In July 2003 NSF, the Bureau of Economic Analyses (BEA), and the U.S. Census Bureau established a data sharing and data linkage project related to globalization of industrial R&D. Specifically, the project goal has been to link the micro-data from the NSF/Census Survey of Industrial Research and Development with BEA's surveys of Foreign Direct Investment in the United States and the US Direct Investment Abroad. Having been completed during the past year, this feasibility study proved successful, and is being extended and expanded during this upcoming summer. The project confirmed that, for the most part, the data reported to the Census Bureau and BEA are comparable and could be linked. In addition, the integrated data set on the domestic and international dimensions of R&D that resulted from the study provided a more comprehensive and detailed picture of U.S. companies' R&D activities than was previously available. For example, the study yielded data for U.S. affiliates and U.S. parent companies on R&D expenditures by character of work (basic research, applied research, development) and on the location of their R&D activities by state. These data will make it possible to examine a number of unexplored issues concerning the R&D activities of U.S. companies such as determining the portion of domestic R&D spending accounted for by U.S. companies that are foreign owned or that are U.S. direct investors abroad.

In June 2004, NSF and BEA entered into a multi-year agreement to support the development of an R&D satellite account (that is, capitalizing R&D as an investment rather than treating it as an expense) that uses the National Income and Product Account framework. The construction of an R&D Satellite Account (SA) within a NIPA framework allows for the estimation of the impact of R&D on GDP and other macroeconomic aggregates as well as the estimation of the contribution of R&D to economic growth. A preliminary set of estimates were released last fall by the BEA, and work is continuing to develop a fuller and industry-specific set of estimates.

SRS also want to suggest that a yet undeveloped but potentially very rich data source for innovation related metrics is contained on patent applications. U.S. patent applications, both those just applied for, as well as those being granted, contain information valuable to any system of innovation metrics. Information submitted on every patent application includes the types of technology developed, the geographic location of the inventor and or the owner, the sector (industry, academia, government) origin, the prior art including

the technologies and science leading up to the new invention, incidence of co-invention including co-inventors from different countries, and much more. In addition, a developing database compiling similar data on patent applications from around the world is actively being worked on (with representatives from the USPTO and NSF actively participating) and will offer exciting data mining opportunities in the near future.

As administratively collected data, patent applications and patent grants offer the opportunity for more timely data, at a very low cost, especially as more and more applications are filed electronically. Innovative use of patent data can make an important contribution to the new system of innovation metrics and fits squarely in category “Identification of appropriate economy-wide and sector specific statistical series or other indicators that could be used to quantify innovation /or its impacts.”

In addition to the activities described above, SRS has a number of additional data tabulation and survey design efforts underway that will help illuminate and inform policy-makers on innovation within the United States. We are at the initial phase of reviewing and redesigning our survey of academic R&D, with an intention to consider data collection beyond R&D expenditures and include innovation-related metrics. We have a number of data collection efforts detailing the human dimensions of science and engineering activities, and have begun to examine the critical role that post-docs contribute to the S&E enterprise.

The National Science Foundation looks forward to contributing to your effort in the future and again wishes to express our appreciation for the opportunity to offer comments and suggestions.

Sincerely,

Lynda T. Carlson, Ph.D.

Director

Division of Science Resources Statistics

National Science Foundation

U.S. Government